Liquid Waste Laboratory Facilities Tour

October 23, 2007

Tour Script

703-46A Badge Office

The Liquid Waste Laboratory Facilities Tour will begin momentarily. I suggest you consider using the Rest Rooms located here in the Badge Office prior to the start of the tour. There will be a Rest Room break about mid-way through the tour.

Good afternoon, my name is Robert Edwards. I am Director of the Nuclear Materials Programs Division for the Nuclear Materials Stabilization Project which has oversight authority for the major laboratory facilities which provide support to the Liquid Waste program, notably the Savannah River National Laboratory and the F/H Analytical Laboratory. I would like to extend my welcome to everyone here today attending the Liquid Waste Laboratory Facilities Tour.

I would like to introduce the DOE personnel present who will be accompanying the tour group on the tour. They are:

Irma Brown, Liquid Waste Acquisition Contracting Officer

Thomas Gutmann, Waste Disposition Programs Division

Fritz Roemer, Nuclear Materials Operations Division Facility Representative

This tour has been fully scripted. This script and the slide presentation that you will view while on the tour will be published on the Liquid Waste Acquisition website following

the tour. I will not be deviating from the tour script during the tour. No questions will be entertained during the tour. However, 3 by 5 cards are available for recording and submitting written questions during the tour. If you have a question during the tour, please see Tom Gutmann or Fritz Roemer for a 3 by 5 card for you to record your question. Return the 3 by 5 cards to Tom or Fritz prior to the conclusion of the tour. Responses to questions will be posted to the Liquid Waste Acquisition website following the conclusion of the tour.

Soon we will be entering a Limited Area. A Limited Area is a type of security area with boundaries defined by physical barriers used for protection of classified matter and/or special nuclear material. No contraband is permitted in a Limited Area. Contraband includes:

- Transmitting devices such as cellular phones, blackberries, and pagers with transmitting capability
- Recording devices
- Cameras
- Undeveloped film
- Computer equipment, including personal digital assistants
- Copying devices
- Radios
- Weapons, including knives with blades more than 3 inches long

If you are in possession of any contraband, you must return such items to your vehicle for the duration of the tour. There is also the possibility that you will need to pass through a

metal detector. If you have any metal items on your person that you do not wish to display to our Security Personnel, you should return such items to your vehicle for the duration of the tour. If you need to return any items to your vehicle, please do so at this time.

Guard Shack

This is one last reminder before we enter the Limited Area to make sure that you are not in possession of any contraband. Again, contraband includes personal electronic devices such as cell phones, blackberries, personal digital assistants, and transmitting pagers, as well as recording devices, copying devices, cameras, film, laptops, radios and weapons. If you are in possession of any contraband, you must return them to your vehicle immediately.

Lobby 773-A

Welcome to the Savannah River National Laboratory (or SRNL) – a laboratory that is available as a resource to support plant operations, plant decontamination and decommissioning, off-site DOE plants and laboratories, universities and work for others. SRNL is not the only laboratory on site. However, it is by far the largest and possesses unique research, development and analytical capabilities.

We will observe a slide presentation that lasts approximately 30 minutes and which briefly describes the technical capabilities of laboratory facilities at SRS which provide support to the Liquid Waste program. The slide presentation primarily focuses on SRNL and the F/H Analytical Laboratory, which is also referred to as the Central Laboratory,

since these two laboratory facilities are the predominant suppliers of research, development, and analytical services to the Liquid Waste program. However, the presentation will also touch on other laboratory and associated facilities which support the Liquid Waste program.

Before we proceed to the conference room for the slide presentation, I wish to emphasize that your safety and the safety of all our workers is paramount here at SRS. Please use caution during the conduct of the tour to avoid injury. For your own safety and the safety of others, it is important to use the handrails when climbing or descending any steps. Please watch for tripping hazards that may be present in some of the locations on the tour. Make sure to wear the safety equipment that will be furnished to you during parts of the tour. This equipment will include safety glasses and hard hats. If you need any assistance with fitting the hard hats, please let me or one of the other tour guides know so we can ensure a proper fit. If at any point you see something that appears unsafe to you, please speak up. We want to make sure that by the end of this tour each one of you is in as good a condition as you are right now.

We will now proceed to the conference room which is on the second floor.

Prior to entering this conference room, I am required to state that the following electronic devices are prohibited:

- Personally and Government owned transmitting devices (pagers, data devices, cellular phones)
- Personally and Government owned tape recorders
- Personally and Government owned cameras
- Personally and Government owned computer equipment

Slide Presentation

773-A Breezeway

This is a model of the SRNL facilities inside the Limited Area fence. This is the main 773-A building where we are currently located. It includes laboratory modules with radiohoods, radiobenches and gloveboxes; shielded cells; intermediate level cells; robotics; a Control Room; support systems; and office space for Operations, Engineering, Chemists, and Laboratory Technicians. Almost all of the radiological analyses perfomed at SRNL are done in this building. Following the completion of analytical and research work, residual materials are dispositioned according to their source. For residual materials associated with on-site customers, solids are packaged as waste and disposed of on-site or at another DOE facility off-site; and solutions are disposed of in high and low activity drain lines and gravity fed to the 776-A tank farm facility for further processing. For residual materials associated with off-site customers, solids and liquids are packaged and transported back to the originator. Larger scale research and development, non-radiological work is done in 786-A Engineering Development Lab.

773-A

As we enter the laboratory facilities, you will see that access to some of the viewing windows is limited. To address this, we will cycle people past the viewing windows, and repeat the information presented, if necessary, so that everyone can see and hear.
Next, we will be entering the Environmental and Chemical Process Technology areas of SRNL. There we will discuss the analyses that support Liquid Waste Operations, including the Tank Farms, the Defense Waste Processing Facility (DWPF), the Saltstone Facility, the Actinide Removal Process (ARP) and the Modular Caustic Side Solvent Extraction Unit (MCU). Then, we will proceed down B-Wing where you will see office spaces on your left and laboratory modules on your right.

These radiochemistry and analytical laboratories contain instruments, non-radioactive hoods, radiohoods, radiobenches, and gloveboxes capable of handling radioactive and/or hazardous materials. SRNL has, in many cases, duplicate instruments – one for non-radioactive samples and a "contained" instrument (in a radiohood or a glovebox) for radiological samples. Gloveboxes are sealed compartments with attached gloves that allow workers to handle highly contaminated and hazardous materials safely. Sample characterization of materials and process development testing with actual waste are done in gloveboxes. Radiological analysis capabilities extend to full metals analysis (Inductively-Coupled Plasma – Mass Spectrometry, Inductively-Coupled Plasma – Emission Spectroscopy) and organics analysis capabilities (volatile and semi-volatile organics). Organic and ionic characterization methods utilized include Gas

Chromatography – Mass Spectrometry, High-Performance Liquid Chromatography, Ion Chromatography, and solution chemistry. Materials (solids and powders) are characterized by Scanning Electron Microscopy, X-ray Fluorescence and Diffraction, and particle size analysis. SRNL does computational modeling for process and engineering support. Examples of this include fluid flow modeling for equipment installations such as where to install pumps in waste tanks and vapor space modeling such as benzene generation in vaults. SRNL also does performance assessment modeling. An example of this would be F-Tank Farm closure performance modeling where modeling results drive closure plans and materials, such as grouts, cap materials, and other barriers. Ultimately, results are passed back to research groups that are working to develop appropriate and effective processes.

Downstairs, we will be entering a Radiological Buffer Area (RBA) where no contamination is expected to be found. No eating, drinking, chewing, or the like are allowed in the RBA. While it is unlikely that contamination is present, the RBA is established to provide a "buffer" between the contaminated area of the cells and the "clean" portion of the facility where the technicians work with manipulators to analyze materials inside the cells. For this reason, each of you will be monitored for contamination prior to exiting the RBA.

The Shielded Cells are used for receipt and analysis of highly radioactive or contaminated materials. In the Shielded Cells, samples are diluted or subdivided for subsequent analysis in hoods or gloveboxes. With regard to the Liquid Waste program, the Shielded Cells play a significant role in process support and process development. For example, samples taken from DWPF waste feed batches are analyzed to develop the appropriate frit formulation for such waste (frit being the mix of nonradioactive constituents, including glass formers, that are added to the waste feed to be processed at DWPF). Another example is the analysis of waste samples taken from tanks undergoing the closure process to develop grout formulations appropriate to immobilize residual waste in tanks being closed. A third example is where the Shielded cells are used to perform bench-scale process development runs using actual waste samples to evaluate processes for effectiveness and for chemical reactions of interest such as catalytic reactions and flammable gas generation.

You will now undergo monitoring for contamination. You must be monitored before exiting the Shielded Cells Radiological Buffer Area.

Before exiting the laboratory portion of the 773-A facility, you must undergo a final monitoring for contamination using the hand and foot contamination monitors. If you are unfamiliar with how to use this type of monitoring equipment, please raise your hand so that we may assist you.

786-A

This is the Engineering Development Laboratory which is used to perform large scale innovative experimental tests and demonstrations of existing equipment and prototype equipment designs.

You will now be provided with safety glasses. Please put these safety glasses on now and keep them on until we exit this building. Keep the safety glasses with you throughout the remainder of the tour since they will be needed again and I will collect them at the end of the tour.

This fully-equipped, climate-controlled, 10,000 square foot laboratory contains three high bays, three overhead cranes, a large fabrication shop, ample electrical support systems, several data acquisition systems, and over 3,000 pieces of measuring and test instrumentation. SRNL designs and builds custom experimental facilities to provide a unique core capability to meet customer needs. These experimental constructs build on key applied technologies in engineering modeling and simulation, radioactive materials handling, process engineering development, and pilot testing. Key applied technologies include filtration, mixing, phase separation, chemical reaction, stabilization/solidification, ion exchange, remediation, pump testing, valve performance, and thermal properties analysis.

SRNL has consistently supported efforts at the Saltstone Facility to improve pumps, mixers and other process equipment with design and testing work conducted here at the Engineering Development Lab.

Vitrification – the immobilization of a material in glass – is accomplished at DWPF by mixing specially formulated solid granulated glass forming materials – very similar to common sand – with waste feed and then introducing this mixture into the DWPF melter where, at the very high temperatures inside the melter, the glass formers and waste mix to become a molten glass. Because the hazardous components of the waste are bonded within the glass structure, vitrification produces a very durable waste form that is environmentally stable for thousands of years. SRNL developed the key technologies and processes used in the Defense Waste Processing Facility (DWPF), the largest radioactive waste glassification plant in the world. In addition to developing the flowsheets needed for initial startup, SRNL continues to provide technology support to enhance and improve DWPF operations. This melter was previously used to support DWPF process development and serves as an example of the kind of large scale test support this SRNL facility can provide.

723-A

This building is used by Engineering Equipment and Systems Department and has a High Bay for Tank Wall Mock-up work. The High Bay is fully enclosed and is 80 feet in

height. It is equipped with a 2-ton crane and has multiple working platforms at various levels including a simulant preparation and mock-up platform on the first level. It is also supplied with auxiliary system support services such as plant air, domestic water and up to 440 Volt electrical service. It has interchangeable / reconfigurable metal grated floor panels, and can be accessed through a large roll-up door.

You will need to wear safety glasses and a hard hat to view the Tank Wall Mock-up. If you need any assistance with fitting the hard hats, please let me or one of the other tour guides know so we can ensure a proper fit.

Tank Wall Mock-up

This is the 30 foot high steel Tank Wall Mock-up. It features decreasing wall plate thickness as the wall height increases which is typical of the design of the tanks in the Liquid Waste tank farms. The High Bay features for the Tank Wall Mock-up include remote deployment platforms and interfaces at the 30 and 38 foot levels, various mock-up tank riser interface inserts, a four coil cooling water loop mock-up at the 20 foot level, a tank annular space mock-up at the first level, and multiple annulus access port mock-up inserts and mounting locations.

We will now proceed to the Aiken County Technical Laboratory.

ACTL

Aiken County Technical Laboratory (ACTL) is owned by Aiken County and leased by DOE for SRNL to conduct research and development. It has 10,000 square feet of laboratory and research space.

The laboratory modules contain non-radioactive hoods for use in developing DWPF sludge feed batch preparation strategies, that is, the work done here supports the determination of how much sludge waste from which tanks should be blended and what sludge washing strategy should be applied based on the characteristics of the blended sludge waste. Using a non-radioactive sludge waste simulant formulated by SRNL, bench-scale and some pilot scale testing is conducted here at ACTL. The ACTL test results permit an initial determination of process parameters. Following this ACTL work, SRNL subjects actual tank farm sludge waste samples to the DWPF waste pretreatment process on a small scale in 773-A Shielded Cells. This allows for process refinement and the identification of any unexpected issues.

We will now enter the laboratory area. You will need to wear safety glasses while touring the laboratory area.

SRNL has a high degree of expertise in high temperature processing and melter technologies, including joule-heating, plasma-heating, and advanced melter technologies.

The equipment here includes:

- Cylindrical Induction Melter– a compact, high temperature glass melter utilizing an induction heated platinum vessel. The melter's compact size allows it to be installed inside a glovebox and/or hot cell.
- Cold Cap Evaluation Furnace– used to evaluate cold cap behavior of simulated DWPF feeds. (The term "cold cap" refers to the semi-solid crust that forms on the surface of the melt pool in the DWPF melter.)
- Slurry Fed Melt Rate Furnace– final testing of recommending feed/frit formulation for use at DWPF is performed using this furnace.

This concludes the Liquid Waste laboratory facilities tour. We will now board the van for the return trip to the Badge Office parking lot. At the Badge Office parking lot, I will be making a final collection of any 3 by 5 cards with questions that have not yet been turned in. Thank you for participating in today's tour.